various modifications thereof will become apparent to those skilled in the art upon reading the specification. Therefore, it is to be understood that the invention disclosed herein is intended to cover such modifications as fall within the scope of the appended claims.

1. An apparatus, comprising:

at least one process microchannel having a height, width and length, the height being up to about 10 mm, the process microchannel having a base wall extending in one direction along the width of the process microchannel and in another direction along the length of the process microchannel;

at least one fin projecting into the process microchannel from the base wall and extending along at least part of the length of the process microchannel; and

a catalyst or a sorption medium supported by the fin.

2. The apparatus of claim 1 wherein the at least one process microchannel comprises a plurality of process microchannels extending parallel to each other.

3. The apparatus of claim 1 wherein the at least one fin comprises a plurality of parallel spaced fins.

4. The apparatus of claim 1 wherein the process microchannel has an upper wall spaced apart from and facing the base wall, the fin extending from the base wall to the upper wall.

5. The apparatus of claim 1 wherein the process microchannel has an upper wall spaced apart from and facing the base wall, the fin extending from the base wall part way toward the upper wall.

6. The apparatus of claim 1 wherein the fin has an exterior surface and a porous material overlies at least part of the exterior surface of the fin, the catalyst or sorption medium being supported by the porous material.

7. The apparatus of claim 6 wherein the porous material comprises a coating, fibers, foam or felt.

8. The apparatus of claim 1 wherein the fin has an exterior surface and a plurality fibers or protrusions extend from at least part of the exterior surface of the fin, the catalyst or sorption medium being supported by the protrusions.

9. The apparatus of claim 1 wherein the fin has an exterior surface and the catalyst or sorption medium is: washcoated on at least part of the exterior surface of the fin; grown on at least part of the exterior surface of the fin from solution; or deposited on at least part of the exterior surface of the fin using vapor deposition.

10. The apparatus of claim 1 wherein the fin extends continuously along at least part of the length of the microchannel.

11. The apparatus of claim 1 wherein the fin extends discontinuously along at least part of the length of the microchannel.

12. The apparatus of claim 1 wherein the fin comprises a plurality of separate fin members extending along at least part of the length of the microchannel.

13. The apparatus of claim 1 wherein the at least one fin comprises a plurality of parallel spaced fins, at least one of the fins having a length that is different than the length of the other fins.

14. The apparatus of claim 1 wherein the at least one fin comprises a plurality of parallel spaced fins, at least one of the fins having a height that is different than the height of the other fins.

15. The apparatus of claim 1 wherein the cross section of the fin has the shape of a square or a rectangle.

16. The apparatus of claim 1 wherein the cross section of the fin has the shape of a trapezoid.

17. The apparatus of claim 1 wherein the fin is made separately from the microchannel and is inserted into the microchannel.

18. The apparatus of claim 1 wherein the fin is formed on the base wall of the microchannel.

19. The apparatus of claim 1 wherein the fin is cut into the interior surface of the base wall of the microchannel.

20. The apparatus of claim 1 wherein the process microchannel is made of a material comprising: steel; aluminum; titanium; nickel; platinum; rhodium; copper; chromium; brass; an alloy of any of the foregoing metals; a polymer; ceramics; glass; a composite comprising a polymer and fiberglass; quartz; silicon; or a combination of two or more thereof.

21. The apparatus of claim 1 wherein the fin is made of a material comprising: steel; aluminum; titanium; nickel; platinum; rhodium; copper; chromium; brass; an alloy of any of the foregoing metals; a polymer; ceramics; glass; a composite comprising polymer and fiberglass; quartz; silicon; or a combination of two or more thereof.

22. The apparatus of claim 1 wherein the fin is made of an alumina forming material.

23. The apparatus of claim 1 wherein the fin is made of FeCrAlY.

24. The apparatus of claim 1 wherein the apparatus further comprises at least one heat exchange channel adjacent to the microchannel.

25. The apparatus of claim 24 wherein the heat exchange channel is a microchannel.

26. The apparatus of claim 24 wherein the heat exchange channel is made of a material comprising: steel; aluminum; titanium; nickel; platinum; rhodium; copper; chromium; brass; an alloy of any of the foregoing metals; a polymer; ceramics; glass; a composite comprising polymer and fiberglass; quartz; silicon; or a combination of two or more thereof.

27. The apparatus of claim 1 wherein the catalyst comprises a catalyst useful in conducting one or more of the following chemical reactions: acetylation addition, alkylation, dealkylation, hydrodealkylation, reductive alkylation, amination, ammonia synthesis, aromatization, arylation, autothermal reforming, carbonylation, decarbonylation, reductive carbonylation, carboxylation, reductive carboxylation, reductive coupling, condensation, cracking, hydrocracking, cyclization, cyclooligomerization, ammoxidation, water-gas shift, dehalogenation, dimerization, epoxidation, esterification, Fischer-Tropsch reaction, halogenation, hydrohalogenation, homologation, hydration, dehydration, hydrogenation, dehydrogenation, hydrocarboxylation, hydroformylation, hydrogenolysis, hydrometallation, hydrosilation, hydrolysis, hydrotreating, isomerization, methylation, demethylation, metathesis, methanol synthesis, nitration, oxidation, partial oxidation, polymerization, reduction, reformation, reverse water gas shift, sulfonation, telomerization, transesterification, trimerization, Sabatier reaction, carbon dioxide reforming, preferential oxidation, or preferential methanation.

28. The apparatus of claim 1 wherein the catalyst comprises a metal, metal oxide or mixed metal oxide of a metal